

stances. Even so, some of the lines of thought opened up by Professor Stycos should be of value as a guide to similar inquiries in other countries.

P. R. C.

Further information about Puerto Rican fertility is given in an article by Stycos, Back and Hill in the April, 1956 number of the *Milbank Memorial Fund Quarterly*. This article, entitled "Contraception and Catholicism in Puerto Rico," shows from the results of sample inquiries that the opinions and wishes of Catholics in regard to family size are little different from those of other religious denominations. A high proportion of persons of all beliefs are in favour of birth control, but Catholics perhaps tend to defer its use longer than others.—EDITOR.

GENETICS

Goldschmidt, Richard B. *Theoretical Genetics*. Berkeley and Los Angeles, 1955. University of California Press (London, Cambridge University Press). Pp x + 563. Price 64s.

DURING the last ten years, fundamental studies on the nature and action of the material basis of heredity have made rapid strides. Startling discoveries have resulted from the use, not only of our familiar friend *Drosophila*, but also of maize, yeasts, fungi, bacteria, bacteriophage, viruses, protozoa, amphibia and a host of other organisms. The techniques used are even more varied and the resulting publications numerous and often bewildering to the non-specialist. Professor Goldschmidt has now successfully completed, despite his seventy-eight years, the formidable task of collecting together this mass of unwieldy facts, analysing them and extracting from them a theory all his own. He deserves the admiration of us all.

Richard Goldschmidt's important contributions to genetics extend over forty-five years. During that time he has been responsible for a steady stream of original and arresting ideas. Somewhere in this latest of his many books he says "I have always been among the skeptics . . ."; few indeed of

the more widely held beliefs on the fundamental nature of genetic material and evolutionary processes meet with his approval. In *Theoretical Genetics* he tells us why.

This book, then, is a "personal report" rather than an impartial review. It is a result of the author's belief that the outline of a future theoretical genetics can now be sketched. The topics chosen and material discussed are, inevitably, a selection from those available; ones of less interest to the author or less relevance to the problem are omitted. Readers will, for instance, find only the barest reference to genetical work on Man, although many of the latest biochemical and serological discoveries might well be considered relevant.

The first section, of nearly 200 pages, reviews evidence on the nature and organization of the genetic material. The amount of detail can be judged from the fact that some thirty pages, or 10,000 words, are devoted to deoxyribose nucleic acid alone. Other topics include the role of heterochromatin, the action of mutagens, the "position effect," and the recent intriguing discoveries concerning crossing-over between alleles. Recent work on these phenomena, especially the last two, have clearly strengthened the author's belief that the classical theory of the gene is hopelessly out of date. He replaces the corpuscular genes, arranged like beads on a string, by overlapping functional fields, each controlling a "master reaction," but each only part of a larger field, concerned with more basic developmental processes. Thus the whole chromosome is visualized as a functional unit, composed of a hierarchy of fields. Many geneticists, while agreeing that classical theories need modification, may well find it difficult to accept the author's view that all mutations are just changes of pattern: submicroscopic rearrangements, deletions and the like.

After fifty pages on the genetical rôle of the cytoplasm, in which he attacks the theory of plasmagenes, Professor Goldschmidt discusses at length the action of the genetical material. He reiterates his opinion that the study of phenocopies

is fundamental in the attempt to elucidate gene action. In later chapters, on the genic control of development, the importance of changes in reaction velocities etc. is stressed; dominance is discussed from this "kinetic" aspect. The author reviews the painstaking work (mainly with *Drosophila* mutants) concerning the effects of different doses of genetic material and also produces a new classification of pleiotropisms. The next section, on the genetics of sex determination, deals only with some specific aspects of the subject, very much within the framework of Goldschmidt's own "balance theory," based on his work with *Lymantria*. The author concludes by explaining the advantages of his "repatterning" theory of gene mutation for an understanding of the mechanism of genic and chromosomal evolution, also why it has led him to reject neo-Darwinian views on speciation. Finally, there are fifty invaluable pages of bibliography, containing about 1,000 references in all, followed by an author and subject index.

Enough has been said to show that this is a very interesting and individual work, by someone with strong opinions of his own. Opposing opinions are, however, presented too, often in great detail. The author's views may indeed be opposed vigorously, but no geneticist can afford to ignore them. Their up-to-date presentation should, therefore, stimulate many to consider more carefully the bases of their beliefs. This book is also valuable and timely because it gives an expert account of many fascinating fields of genetic research and, from this aspect, can be read with profit by all who wish to know more about this rapidly expanding science, though non-geneticists will find it rather tough going. The general layout of the book is excellent.

A. G. SEARLE.

HEREDITY COUNSELLING

Hammons, Helen G. *Heredity Counseling: Its Services and Centers.* New York, 1956. American Eugenics Society. Pp. 16. Price 25 cents.

THIS pamphlet has been produced for American doctors, nurses, marriage counsellors and parents. Its aim is to tell them what a heredity counselling clinic can offer to help individuals who have anxieties about the inheritance they will transmit to their children, and where such clinics are to be found both in the U.S.A. and elsewhere.

Mrs. Hammons is not herself either a geneticist or a doctor and, apart from an unnecessarily gloomy reference to the risk after having had one child with hydrocephaly or spina bifida and that after malformations of all kinds, she gives a fair picture. She also refers the reader to an excellent article by Dr. C. Fraser of Montreal for a list of risks, but, as she stresses, it is the job of the clinic to assess these risks for the individual patient.

The United States differs from this country, Europe and Japan in that most of those giving advice in heredity counselling clinics are genetically, but not medically, trained. This has obvious disadvantages. But where so many medical courses include no instruction on genetics beyond that given in the zoology and botany classes it is difficult to find those trained in both specialties; it is to the credit of American geneticists that they have tried to meet the need.

Mrs. Hammons rightly cites Denmark as the best served country in the world for heredity counselling and refers to Professor Kemp's Institute for Human Genetics, where an admirable record of mental illness, mental defect, congenital malformations, and genetically determined disorder is kept. Often when an individual asks for advice in Denmark there is much information about his family already in the register. She gives good descriptions of the facilities available in other countries, though the list for England is inaccurate and should be revised in a later edition of the pamphlet. Even now, in spite of our rudimentary knowledge of medical genetics, heredity clinics can do something to lighten the burden of genetically determined ill-health, and popular education through such pamphlets is most desirable.

C. O. C.